SECTION 2.0

Project Description

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The City of San Francisco (City) is proposing to construct and operate a simple-cycle power plant, the San Francisco Electric Reliability Project (SFERP), in the City and County of San Francisco (CCSF).

2.1 Introduction

The SFERP will consist of a nominal 145-megawatt (MW) simple-cycle plant, using three natural gas-fired General Electric LM 6000 gas turbines and associated infrastructure. The project site is located near the San Francisco Bay in the Potrero District of San Francisco, on a 4-acre site of City-owned land (see Figure 2-1).

The project will include the construction of a new air-insulated 115-kilovolt (kV) switchyard on the north side of the site adjacent to 25th Street. PG&E is currently performing a Facilities Study to evaluate whether the SFERP circuits will enter the switchyard underground from Illinois Street or continue north to 22nd Street. The circuits would then run east in 22nd Street to an underground/overhead transition structure located on the eastern portion of the Potrero switchyard. This overhead line would then connect with the switchyard bus in an overhead arrangement. Electrical generation will be at 13.8 kV, which will be stepped up with 115-kV step-up transformers.

A pipeline tie-in will be made to the existing PG&E natural gas transmission line at the intersection of Illinois and 25th streets. Natural gas for the facility will be delivered through a new 900-foot-long, 12-inch-diameter (or less) pipeline. This service will be connected to a booster compressor station that will be part of the SFERP facility. Process water for the project will be obtained via a water pump station (WPS) located on Marin Street near Cesar Chavez Street which will connect to a new recycled water plant located on the southern portion of the project site.

The City will provide wastewater effluent for the onsite recycled water treatment. The WPS will be located in an existing combined sewer system structure and will include three variable frequency drive pumps (two operational and one standby). A seven-tenths-of-a-mile long pipeline will connect the WPS and the SFERP's onsite recycled water treatment system. The seven-tenths of a mile-long pipeline consists of two sections. Approximately 1,300 feet of the pipeline will be installed within an existing collection box. The remaining section will be new construction (Figure 2-1; all figures appear at the end of this section). The onsite treatment system will be designed to produce Title 22 quality recycled water for industrial use at the SFERP.

Plant wastewater and reject water from the SFERP wastewater treatment system will be discharged into the City's combined sewer system, which routes the waste to the City of San Francisco Southeast Water Pollution Control Plant (SEWPCP).

Stormwater will be collected onsite during operations and will be directed to the stormwater collection system at the adjacent MUNI Metro East site. Their system then discharges the stormwater into the combined sewer system.

The plant's design will incorporate air pollution emission controls designed to meet the best available technology stringent standards required by the State and the Bay Area Air Quality Management District. These controls will include water injection for combustion control of nitrogen emissions, a selective catalytic reduction system (SCR) for post combustion control oxides of nitrogen emissions, and an oxidation catalyst system to control carbon monoxide and precursor organic compound emissions.

Site access will be provided via 25th Street at the northern side of the plant site. The plant will be accessed from 25th Street via Illinois Street, with vicinity access via Interstate 280 (I-280).

The site for SFERP is approximately 4.0 acres of City-owned property. The San Francisco Public Utilities Commission (SFPUC) is pursuing a memorandum of understanding, based on a signed letter of intent for an option to transfer the beneficial use of the property from the Municipal Transportation Agency (MUNI), another City department, to the SFPUC. The memorandum of understanding will be subject to approval by MUNI's Board of Directors, the Public Utilities Commission and the San Francisco Port Commission. The SFPUC intends to obtain these approvals within the next two months. Additional information on location is presented in Section 1.

The following sections describe the design and operation of the project and the associated electric transmission line, natural gas supply line, and water lines. Site selection and the alternative sites considered are presented in Section 9, Alternatives.

2.2 Project Description, Design, and Operation

This section describes the facility's conceptual design and proposed operation.

2.2.1 Site Plan and Access

The site arrangement shown in Figure 2-2 and the typical elevation views presented in Figure 2-3 illustrate the location and size of the proposed facility. Approximately 4.0 fenced acres will be required to accommodate the generation facilities. The construction laydown area will be approximately 8.5 acres and located on land leased from the Port of San Francisco. The laydown area is located directly east and adjacent to the project site between the project site and the waterfront (see Figure 2-1).

The plant site has been cleared of all permanent structures. Currently, there are some temporary facilities on the property including construction trailers, a construction laydown area and a cement batch plant. The temporary facilities will be removed prior to the construction of the SFERP.

2.2.2 Process Description

The project will consist of three General Electric LM 6000 gas combustion turbine generators (CTGs) equipped with water injection to control oxides of nitrogen (NO_x) emissions, and power augmentation. SCR will be used for further NO_x control. An oxidation catalyst and associated support equipment are also provided.

Each CTG will generate a nominal 48 MW with the use of chillers. The project is expected to have an overall annual availability approaching 100 percent. The heat and water balances for the facility are shown in Figures 2-4 and 2-5.

Associated equipment will include a 2-cell cooling tower for the inlet air chillers and emission control systems necessary to meet the proposed emission limits. NO_x emissions will be controlled to 2.5 parts per million by volume, dry (ppmvd) basis corrected to 15 percent oxygen by a combination of water injection in the CTGs and SCR systems in the exhaust stack transition. Carbon monoxide (CO) will be controlled to 4 ppmvd at 15 percent oxygen in the CTG combustors with an oxidation catalyst system. Precursor organic compound (POC) emissions will be controlled to 2 ppmvd at 15 percent oxygen.

2.2.3 Plant Cycle

CTG combustion air will flow through the inlet air filters and chiller coils (and associated air inlet ductwork), be compressed, and then flow to the CTG combustion sections. Natural gas fuel will be injected into the compressed air in the combustion sections and ignited. The hot combustion gases will expand through the turbine sections of the CTGs, causing them to rotate and drive the electric generators and CTG compressors. The hot combustion gases will exit the turbine sections, enter a transition that will house the SCR and oxidation catalyst systems, and exit to the atmosphere through the exhaust stacks.

2.2.4 Combustion Turbine Generators

Thermal energy will be produced in the three CTGs through the combustion of natural gas, which will be converted into the mechanical energy required to drive the combustion turbine compressors and electric generators. Three aeroderivative CTGs have been selected for the project. General Electric will supply these CTGs. The aeroderivative technology is the most efficient simple-cycle CTG on the market and has a documented availability record of 97.8 percent. The construction and commissioning process for the plant will take approximately 12 months.

Each CTG system will consist of a CTG with supporting systems and associated auxiliary equipment. The CTGs will have water injection for controlling NO_x emissions and for power augmentation; CTG exhaust emissions will be further reduced through the use of SCR and oxidation catalyst systems.

The CTGs will be equipped with the following required accessories to provide safe and reliable operation:

- Inlet air chilling
- Inlet air filters
- Metal acoustical enclosure
- Lube oil cooler
- Water injection system
- Turbine enclosure vent fans
- Generator enclosure vent fans

- Fire detection and protection system

Inlet combustion air will be cooled via a chilled water system to increase turbine performance during high ambient conditions. The combustion turbine also will have water injection spray evaporative intercooling between the low-pressure and the high pressure compressor sections to increase CTG performance. Water injection into the CTG combustor will be used to suppress flame temperature and thereby control NO_x emissions at the outlet of the CTG.

The exhaust stack transition will be equipped with a post combustion control system that will use ammonia vapor in the presence of a selective catalyst, commonly referred to as an SCR system, to further reduce the NO_x concentration in the exhaust gases. The catalyst module will be located between the CTG exhaust gas transition section and the exhaust stack base. Diluted ammonia vapor (NH_3) will be injected into the exhaust gas stream through a grid of nozzles located upstream of the catalyst module. The subsequent chemical reaction will reduce NO_x to nitrogen and water, resulting in a NO_x concentration of no more than 2.5 ppmvd at 15 percent oxygen in the exhaust gas. The exhaust stack transition will also include an oxidation catalyst system, which will control CO emissions to 4 ppmvd. POC emissions will be controlled to less than 2 ppmvd. The oxidation catalyst system will be located in the ductwork between the CTG and the SCR system.

2.2.5 Major Electrical Equipment and Systems

2.2.5.1 AC Power—Transmission

Three CTGs will generate electricity at 13.8 kV. An overall single-line diagram of the facility's electrical system is shown in Figure 2-6. The three 13.8-kV generator outputs will be connected by generator bus to individual oil-filled generator step-up transformers, which will increase the voltage to 115-kV. Surge arresters will be provided at the high-voltage bushings to protect the transformers from surges on the 115-kV system caused by lightning strikes or other system disturbances. The transformers will be set on concrete pads within containment systems designed to contain the transformer oil (non-polychlorinated biphenyl [PCB]) in case of a leak or spill. Rated fire barriers will be used to separate critical equipment and to provide fire protection. The high voltage side of each step-up transformer will be connected to an open air 115-kV switchyard located on the project site. An HV underground transmission line will connect to PG&E's Potrero 115-kV Substation. The switchyard will be configured in a highly reliable scheme, as detailed in Section 5.0.

2.2.5.2 AC Power—Distribution to Auxiliaries

Auxiliary power to the combustion turbine power block will be supplied at 4,160 volts alternating current (AC) by a double-ended 4,160-volt (4.16 kV) switchgear lineup. Two non-PCB oil-filled 115 to 4.16-kV station service stepdown transformers will supply primary power to the switchgear.

The 4,160-volt switchgear lineup will supply power to the CTG inlet chiller compressor motors, the natural gas compressors, and to the load center (LC) transformers, and will be rated at 4,160 to 480 volts for 480-volt power distribution.

2.2.5.3 DC Power Supply

Each CTG is equipped with 125-volts direct current (DC) battery/charger systems for its package control system and an on-board fire protection system. The required 480-volt AC power supply will be provided from the associated motor control center (MCC) for each CTG.

One common DC power supply system consisting of a 125-volt DC battery, two 100 percent 125-volt DC full-capacity battery chargers, metering, ground detectors, and distribution panels will be supplied for the balance-of-plant.

Under normal operating conditions, the battery chargers will supply DC power to the DC loads. The battery chargers will receive 480-volt, three-phase AC power from the AC power supply (480-volt) system and continuously charge the batteries while supplying power to the DC loads. The ground detection scheme will detect grounds faults on the DC power supply system.

Under abnormal or emergency conditions, when power from the AC power supply (480-volt) system is unavailable, the battery will supply DC power to the DC loads. Recharging of a discharged battery will occur whenever 480-volt power becomes available from the AC power supply (480-volt) system. The rate of charge will depend on the characteristics of the battery, battery charger, and connected DC load during charging. The anticipated maximum recharge time will be 24 hours.

The 125-volt DC system will also be used to provide control power to the 4,160-volt switchgear, to the 480-volt LCs, and to critical control circuits.

2.2.5.4 Essential Service AC Uninterruptible Power Supply

The combustion turbine power block will also have an essential service 120-volt AC, single-phase, 60-hertz (Hz) power source. This source will supply AC power to essential instrumentation, to critical equipment loads, and to unit protection and safety systems that require uninterruptible AC power. The essential service AC system and DC power supply system will be designed to ensure that critical safety and unit protection control circuits have power and can take the correct action on a unit trip or loss of plant AC power.

The essential service AC system will consist of one full-capacity inverter, a solid-state transfer switch, a manual bypass switch, an alternate source transformer and voltage regulator, and an AC panel board.

The normal source of power to the system will be the DC power supply system through the inverter to the panel board. A solid-state static transfer switch will monitor the inverter output and the alternate AC source continuously. The transfer switch will automatically transfer essential AC loads without interruption from the inverter output to the alternate source upon loss of the inverter output.

A manual bypass switch will also be included to enable isolation of the inverter-static transfer switch for testing and maintenance without interruption to the essential service AC loads.

2.2.6 Fuel System

The CTGs will be designed to burn natural gas. Maximum natural gas requirements during operation are approximately 35,150 million British thermal units per day (MBtus/day) higher heating value (HHV) basis.

The pressure of natural gas delivered to the site via PG&E is expected to be approximately 110 pounds per square inch gauge (psig). The natural gas will be boosted to approximately 690 psig by onsite compressors, and then flow through a gas pressure control station and gas scrubber/filtering equipment, before entering the combustion turbines.

2.2.7 Water Supply and Use

This section describes the quantity of water required and the use of the water supply.

2.2.7.1 Water Requirements

Water consumption includes a cooling tower makeup for cooling from the following heat rejection sources: CTG lube oil system, inlet air chiller condenser, and other minor sources. Additional makeup water is fed to the water treatment system for use in NO_x suppression injection and compressor evaporative cooling. The project's expected peak water consumption is about 362 gallons per minute (gpm) based on full load operation on a hot day. At this rate, total daily peak water use is about 520,000 gallons per day (gpd), based on 24 hours of operation at the sustained peak hourly temperature.

Generation of demineralized water is required to operate the CTG water treatment system. Water filtration and demineralization equipment will be provided to produce and store deionized (DI) water for distribution to the turbines, as required.

2.2.7.2 Water Supply

Approximately 57 percent of the total water requirements for the project will be for water injection to control NO_x emissions and compressor evaporative cooling. The balance of the water will be used in the cooling towers as makeup, for cooling tower blowdown, and for reject from the water treatment system. Process water will be supplied via a WPS located on Marin Street near Cesar Chavez Street. The WPS will convey process water to the new SFERP recycled water treatment system.

2.2.7.3 Water Treatment

Process water will be provided to the SFERP via a 0.76-mile-long underground pipeline, where it will be treated to Title 22 recycled water standards by an onsite treatment system that will include primary, secondary, and tertiary treatment. The primary treatment of the process supply water will be accomplished by use of a traveling band screen constructed of stainless steel perforated plates. Solids will be sluiced from the screen by a water wash system and will be returned to the combined sewer system located in 23rd Street. The secondary treatment will be achieved in an anoxic/aerobic tank to ensure proper biological activity. After the appropriate hydraulic retention time, the water will flow into the tertiary treatment system. The tertiary treatment and filtering will be achieved by incorporation of a Membrane BioReactor (MBR) (Zenon or other similar process). An aerobic zone is created and scouring of the membrane fibers is achieved by the introduction of scouring air through a series of diffusers. The filtered permeate will then be disinfected with an ultraviolet or chlorinated system, depending upon the final design parameters. The recycled water will then be pumped to the recycled water storage tank for use within the plant for all non-potable water applications. A small waste stream containing the MBR-collected solids will be sent to the combined sewer located in 23rd Street. All equipment open to the atmosphere will be vented through an activated carbon collection system to control odors.

The treated water will be divided into supply for the cooling towers and supply for NO_x suppression injection and compressor evaporative cooling. Cooling water treatment may require the addition of chemicals such as a pH control agent (acid or caustic), a mineral scale dispersant (e.g., polyacrylate polymer), a corrosion inhibitor (phosphate based), and a biocide (hypochlorite or equivalent). No chromium-based additives will be used in the cooling water.

The water to be used for NO_x suppression injection and compressor evaporative cooling will be treated with a reverse osmosis (RO) system. The RO product, or permeate, is then fed to an electrodeionization (EDI) system to reduce any remaining ions to the required concentrations for feed into the turbine. Product water from the EDI system will be stored in the DI water storage tank.

Discharges from the water treatment processes and plant wastewater will be sent to the SEWPCP via the combined sewer system.

2.2.8 Plant Cooling Systems

The heat rejection system will consist of a single two-cell wet counter flow cooling tower to remove the heat generated by the turbine inlet chillers and the heat generated by miscellaneous auxiliary heat loads such as lube oil coolers. The cooling tower cells will use treated water as makeup and will have a continuous blowdown to maintain basin dissolved solids in the range of 5 cycles of concentration.

2.2.9 Waste Management

Waste management is the process whereby all wastes produced at the plant will be collected, treated if necessary, and disposed of properly. Wastes will include waste lubricating oils and oily rags. Waste management is discussed in more detail in Subsection 8.13.

2.2.9.1 Solid Waste

The project will produce minimal maintenance and plant wastes typical of power generation operations. An outside contractor will remove all generated wastes to the contractor's establishment for ultimate disposal. Generation plant wastes include: oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other miscellaneous solid wastes, including the typical refuse generated by workers.

2.2.9.2 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by the project. Waste lubricating oil will be recovered and recycled by a waste oil-recycling contractor. Spent lubrication oil filters will be disposed of by the maintenance contractor in a Class I landfill. Spent SCR catalysts will be recycled by the supplier.

2.2.9.3 Wastewater Discharge

Wastewater from the water treatment process, cooling/process water blowdown, and sanitary sewer discharges will be sent to the SEWPCP via the combined sewer system. The interconnection to the combined sewer system will be located in Cesar Chavez Street, on the south side of the project site.

2.2.10 Management of Hazardous Materials

There will be a variety of chemicals stored and used during construction and operation of SFERP. The storage, handling, and use of all chemicals will be conducted in accordance with applicable laws, ordinances, regulations, and standards (LORS). Chemicals will be stored in appropriate chemical storage facilities, bulk chemicals will be stored in storage tanks, and most other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks and spills. Berm and drain piping design will allow a full-tank capacity spill without overflowing the berms. For multiple tanks located within the same bermed area, the capacity of the largest single tank will determine the volume of the bermed area and drain piping. Drain piping for volatile chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors. After neutralization, if required, water collected from the chemical storage areas will be directed to the cooling tower basin.

A 29 percent solution of aqueous ammonia will be stored in a tank with a containment basin and collection sump.

Portable safety showers and eyewashes will be provided adjacent to the ammonia storage tank area. Maintenance personnel will use state-approved, personal protective equipment (PPE) during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals. Visual and audible alarms will alert SFERP personnel and personnel at the adjacent MUNI facility in the event of an ammonia spill. Training will also be provided to SFERP personnel and personnel at the adjacent MUNI facility on the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material will be stored onsite for spill cleanup.

Electric equipment insulating materials will be specified to be free of PCBs.

A list of the chemicals anticipated for use at the facility is provided in Subsection 8.12, Hazardous Materials Handling. Table 8.12-3 identifies each chemical by type and intended use and estimates the quantity to be stored onsite. Subsection 8.12 includes additional information on hazardous materials handling.

2.2.11 Emission Control and Monitoring

Air emissions from the combustion of natural gas in the CTGs will be controlled using state-of-the-art systems. Subsection 8.1, Air Quality, includes additional information on emission control and monitoring, which is summarized below. The air emission rates for the CTGs are summarized in Subsection 2.2.15, Facility Operation.

2.2.11.1 NO_x Emission Control

Water injection and SCR will be used to control NO_x concentrations in the exhaust gas emitted to the atmosphere to 2.5 ppmvd at 15 percent oxygen from the gas turbines. The SCR process will use a 29 percent solution of aqueous ammonia. Ammonia slip, or the concentration of unreacted ammonia in the exiting exhaust gas, will be limited to 10 ppmvd at 15 percent oxygen. The SCR equipment will include a reactor chamber, catalyst modules, ammonia storage system, ammonia vaporization and injection system, and monitoring equipment and sensors.

2.2.11.2 CO and POC Emission Control

CO will be controlled at the CTG combustor with state-of-the-art combustion technology and the use of an oxidation catalyst system. POC emissions will be controlled with advanced combustion controls and the oxidation catalyst system.

2.2.11.3 Particulate Emission Control

Particulate emissions will be controlled using good combustion controls and natural gas as the sole fuel for the CTGs.

2.2.11.4 Continuous Emission Monitoring

A monitoring system will record fuel gas flow rate and monitor the emissions of NO_x, CO, and oxygen in the exhaust gas. This system will generate reports of emissions data in accordance with permit requirements and will send alarm signals to the control room when the level of emissions approaches or exceeds pre-selected limits.

2.2.12 Plant Auxiliaries

The following systems will support, protect, and control the generating facility.

2.2.12.1 Lighting

The lighting system will provide maintenance personnel with illumination under normal conditions. As the generation equipment is located inside a metal enclosure with wide access doors, egress under emergency conditions will not require emergency lighting. The system also will provide 120-volt convenience outlets for portable lamps and tools.

2.2.12.2 Grounding

The electrical system will be susceptible to ground faults, lightning, and switching surges that can result in high voltage—a potential hazard to site personnel and electrical equipment. The station grounding system will provide an adequate path to permit the dissipation of current created by these events.

2.2.12.3 Distributed Control and Information System

The Distributed Control and Information System (DCIS) will provide modulating control, digital control, monitoring, and indicating functions for the plant power block systems. The following functions will be provided:

- Controlling the CTGs and other systems in a coordinated manner
- Controlling the balance-of-plant systems in response to plant demands

- Monitoring controlled plant equipment and process parameters and delivering this information to plant operators
- Providing control displays (printed logs, flat panel displays) for signals generated within the system or received from input/output [I/O])
- Providing consolidated plant process status information through displays presented in a timely and meaningful way
- Providing alarms for out-of-limit parameters or parameter trends, displaying on alarm CRT(s), and recording on an alarm log printer
- Storing and retrieving historical data

The DCIS will be a redundant microprocessor-based system consisting of the following major components:

- CRT-based operator consoles
- Engineer work station
- Distributed processing units
- I/O cabinets
- Historical data unit
- Printers
- Data links to the combustion turbine and steam turbine control systems

2.2.12.4 Cathodic Protection

The cathodic protection system will be designed to control the electrochemical corrosion of designated metal piping buried in the soil. Depending upon the corrosion potential and the site soils, either passive or impressed current cathodic protection will be provided.

2.2.13 Interconnect to Electrical Grid

Each of the three CTGs will be connected to a 3-phase step-up transformer, which will be connected to the plant's 115-kV switchyard. The switchyard will consist of an open air switchyard arranged in the highly-reliable scheme with appropriate disconnect switches, circuit breakers, and grounding switches. From the switchyard, the generated power will be transmitted into PG&E's Potrero 115-kV Substation via underground 115-kV transmission lines. See Section 5.0 for additional information on the switchyard and connection to the PG&E transmission system.

2.2.14 Project Construction

Construction of the generating facility—from site preparation and grading, to commercial operation—is expected to take approximately 12 months. Major milestones are listed in Table 2-1.

TABLE 2-1
Project Schedule Major Milestones

Activity	Date
Begin Construction	Second Quarter 2006
Startup and Test	Second Quarter 2007
Commercial Operation	Second Quarter 2007

The site will be accessed for construction via either 25th or Cesar Chavez and Maryland streets.

The workforce on the project during construction will be approximately 264 people, including construction craft persons and supervisory, support, and construction management personnel (see Subsection 8.8, Socioeconomics).

Normal construction will be scheduled between 7 a.m. and 8 p.m., Monday through Friday. During construction and startup of the project, some activities may continue 24 hours per day, 7 days per week.

2.2.15 Facility Operation

The Applicant intends to operate the facility 24 hours per day, 7 days per week, for up to 12,000 hours per year total for the 3 combustion turbines. The air emissions associated with the operation of the SFERP are presented in Table 2-2.

TABLE 2-2
Air Emission Rates for the Combustion Turbines and Cooling Tower

Pollutant	Parts per Million by Volume @ 15% O_2	Pounds per Hour	Tons per Year
NOx	2.5[a]	4.41	39.8
SO2[b]	0.15	0.45	2.7
CO	4.0[a]	4.30	27.9
POC	2.0[a]	1.23	7.7
PM_{10}/ $PM_{2.5}$	n/a	3.0	18.2[c]

Notes:
[a] NOx, CO, and POC emission rates exclude startups and shutdowns (see Table 8.1-18).
[b] Based on annual average natural gas sulfur content of 0.33 gr/100 scf.
[c] Includes 0.2 tons per year of PM_{10}/ $PM_{2.5}$ emissions from the cooling tower.

2.3 Facility Safety Design

The facility will be designed to maximize safe operation. Hazards that could affect the facility include earthquake, flood, and fire.

2.3.1 Natural Hazards

The principal natural hazards associated with the site are earthquakes and floods. The site is located in Seismic Risk Zone 4. Structures will be designed to meet the seismic requirements of the California Code of Regulations (CCR) Title 24 and the 2001 California Building Code (CBC). Subsection 8.15, Geologic Hazards and Resources, discusses the geological hazards of the area and site. This section includes a review of potential geologic hazards, seismic ground motions, and the potential for soil liquefaction due to ground shaking. Appendix 10 includes the structural seismic design criteria for the buildings and equipment.

The site is essentially flat, with an average elevation of approximately 13.5 feet above mean sea level (msl) and roughly 500 feet (average) from the shoreline. The highest tide ever recorded in the project area is approximately 9.25 feet above the mean average sea level, measured using the North American Vertical Datum (NAVD) (AGS, 1999). Therefore, the project will have no potential to affect or be affected by flooding. Subsection 8.14, Water Resources, includes additional information on the potential for flooding.

2.3.2 Emergency Systems and Safety Precautions

This section discusses the fire protection systems and safety precautions to be used by project personnel. Subsection 8.7, Worker Health and Safety, includes additional information on safety for workers. Appendix 10 contains the design practices and codes applicable to safety design for the project. Compliance with these requirements will minimize project effects on public and employee safety.

2.3.2.1 Fire Protection Systems

The project will rely on both onsite fire protection systems and local fire protection services.

2.3.2.1.1 Onsite Fire Protection Systems. The fire protection systems will be designed to protect personnel and limit property loss and plant downtime from fire or explosion. The project will have the following fire protection systems.

CO_2 Fire Protection System. This system will protect the turbine, generator, and accessory equipment compartments from fire. The system will have fire detection sensors in all compartments. Actuating one sensor will provide a high temperature alarm on the combustion turbine control panel. Actuating a second sensor will trip the combustion turbine, turn off ventilation, close ventilation openings, and automatically release the CO_2. The CO_2 will be discharged at a design concentration adequate to extinguish the fire.

Local Fire Protection Services. In the event of a major fire, plant personnel will be able to call upon the San Francisco Fire Department for assistance. The Hazardous Materials Risk Management Plan (see Subsection 8.12, Hazardous Materials Handling) for the plant will include all information necessary to permit firefighting and other emergency response agencies to plan and implement safe responses to fires, spills, and other emergencies.

2.3.2.2 Personnel Safety Program

The project will operate in compliance with federal and state occupational safety and health program requirements. Compliance with these programs will minimize project effects on employee safety. These programs are described in Subsection 8.7, Worker Health and Safety.

2.4 Facility Reliability

This section discusses the expected plant availability, equipment redundancy, fuel availability, water availability, and project quality control measures.

2.4.1 Plant Availability

The Applicant intends that this facility is able to operate 24 hours per day, 7 days per week, for up to 12,000 engine hours per year cumulative total for the three combustion turbines.

2.4.2 Redundancy of Critical Components

The following subsections identify equipment redundancy as it applies to project availability. Specifically, redundancy in the power block is described. The power block will be served by the following balance-of-plant systems: DCIS, demineralized water system, and closed cycle cooling water system. Redundancy following final design may differ.

2.4.2.1 Power Block

Three separate combustion turbine power generation trains, consisting of a General Electric LM6000 PC Sprint gas turbine and its appurtenances, will operate in parallel within the power block. Each combustion turbine will provide approximately 33 percent of the total power block output. In addition to the combustion turbine-generators, the power block comprises the components described below.

2.4.2.1.1 CTG Subsystems. The combustion turbine subsystems will include the combustion turbine, inlet air filtration and inlet chilling system, generator and excitation systems, and turbine control and instrumentation. The combustion turbine will produce thermal energy through the combustion of natural gas; the thermal energy will be converted into mechanical energy through rotation of the combustion turbine, which drives the compressor and generator. The CTG generators will be totally enclosed and air-cooled. The generator excitation system will be a solid-state static system. Combustion turbine control and instrumentation (interfaced with the DCIS) will cover the turbine governing system, the protective system, and sequence logic.

2.4.2.2 DCIS

The DCIS will provide the following control, monitoring, and alarm functions for plant systems and equipment:

- Control the CTG and other systems in response to unit load demands (coordinated control)
- Provide control room operator interface
- Monitor plant equipment and process parameters and provide this information to the plant operators in a meaningful format
- Provide visual and audible alarms for abnormal events based on field signals or software generated signals from plant systems, processes, or equipment

2.4.2.3 Demineralized Water System

Water for the demineralized water system will be provided from the onsite recycled water system. The demineralized water system will consist of a RO system followed by an EDI system. Demineralized water will be stored in a suitable water tank.

2.4.2.4 Closed Cooling Water System

The closed cooling water system transfers heat from various plant equipment heat exchangers to the circulating water system through the cooling water heat exchangers. This subsystem includes motor-driven centrifugal pumps and a cooling water heat exchanger.

2.4.3 Fuel Availability

Fuel will be delivered by PG&E from its existing gas transmission line, located at the intersection of Illinois and 25th streets. Capacity at the natural gas transmission pipelines that supply natural gas to San Francisco is sufficient to supply the project. Because the project is not designed for a backup fuel supply, it would be shut down in the event natural gas service were interrupted.

2.4.4 Water Availability

The only source of process water for the project will be untreated wastewater from the combined sewer system. The availability of water to meet the needs of the project is discussed in more detail in Section 7, Water Supply, and Subsection 8.14, Water Resources.

2.4.5 Project Quality Control

The objective of the Quality Control Program will be to ensure that all systems and components have the appropriate quality measures applied during design, procurement, fabrication, construction, and operation. The goal of the Quality Control Program is to achieve the desired levels of safety, reliability, availability, operability, constructibility, and maintainability for the generation of electricity.

Assurance of the quality required for a system is obtained by applying appropriate controls to various activities. For example, the appropriate controls for design work are checking and review, and the appropriate controls for manufacturing and construction are inspection and testing. Appropriate controls will be applied to each of the various project activities.

2.4.5.1 Project Stages

For quality assurance planning purposes, project activities have been divided into the following nine stages:

- **Conceptual Design**—Activities such as the definition of requirements and basic engineering analyses.
- **Detail Design**—Activities such as the preparation of calculations, drawings, and lists needed to describe, illustrate, or define systems, structures, or components.
- **Procurement Specification Preparation**—Activities necessary to compile and document the contractual, technical, and quality provisions for procurement specifications for plant systems, components, or services.

- **Manufacturer Control and Surveillance**—Activities necessary to ensure that the manufacturers conform to the provisions of the procurement specifications.
- **Manufacturer Data Review**—Activities required to review manufacturers' drawings, data, instructions, procedures, plans, and other documents to ensure coordination of plant systems and components and conformance to procurement specifications.
- **Receipt Inspection**—Inspection and review of products upon delivery to the construction site.
- **Construction/Installation**—Inspection and review of storage, installation, and cleaning and initial testing of systems or components at the plant site.
- **System/Component Testing**—Actual controlled operation of electrical generating components in a system to ensure that the performance of systems and components conforms to specified requirements.
- **Plant Operation**—Actual operation of the energy facility system as the project progresses, the design, procurement, fabrication, erection, and checkout of each plant system will progress through the nine stages defined above.

2.4.5.2 Quality Control Records

The following quality control records will be maintained for review and reference:

- Project instructions manual
- Design calculations
- Project design manual
- Quality assurance audit reports
- Conformance to construction records drawings
- Procurement specifications (contract issue and change orders)
- Purchase orders and change orders
- Project correspondence

For procured component purchase orders, a list of qualified suppliers and subcontractors will be developed. Before contracts are awarded, the subcontractors' capabilities will be evaluated. The evaluation will include consideration of suppliers' and subcontractors' personnel, production capability, past performance, and quality assurance program.

During construction, field activities will be accomplished during the last four stages of the project: receipt inspection, construction/installation, system/component testing, and plant operation. The construction contractor will be contractually responsible for performing the work in accordance with the quality requirements specified by contract.

The contractors quality compliance along with that of any subcontractors will be surveyed through inspections, audits, and the administration of independent testing contracts.

An Operation and Maintenance (O&M) program, typical for a project of this size, will be implemented by the City or its maintenance contractor to control the quality of plant O&M. A specific program for this project will be defined and implemented during initial plant startup.

2.5 Laws, Ordinances, Regulations, and Standards

The applicable LORS for each engineering discipline are discussed in Section 10, Engineering, and included as part of the Engineering Appendices (Appendix 10).

2.6 Facility Closure

2.6.1 Introduction

Facility closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance, including closure for overhaul or replacement of the combustion turbines. Causes for temporary closure include a disruption in the supply of natural gas or damage to the plant from earthquake, fire, storm, or other natural acts. Permanent closure is defined as a cessation in operations with no intent to restart operations owing to plant age, damage to the plant beyond repair, economic conditions, City policy, or other reasons. Subsection 2.6.2 discusses temporary facility closure; Subsection 2.6.3 discusses permanent facility closure.

2.6.2 Temporary Closure

For a temporary facility closure, where there is no release of hazardous materials, security of the facilities will be maintained on a 24-hour basis, and the California Energy Commission (CEC) and other responsible agencies will be notified. Depending on the length of shutdown necessary, a contingency plan for the temporary cessation of operations will be implemented. The contingency plan will be conducted to ensure conformance with all applicable laws, ordinances, regulations, and standards (LORS) and the protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, may include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes will be disposed of according to applicable LORS, as discussed in Subsection 8.13, Waste Management.

Where the temporary closure includes damage to the facility, and there is a release or threatened release of acutely hazardous materials into the environment, procedures will be followed as set forth in a Risk Management Plan (RMP) to be developed as described in Subsection 8.12, Hazardous Materials. Procedures will include methods to control releases, notification of applicable authorities and the public, emergency response, and training for plant personnel in responding to and controlling releases of hazardous materials. Once the immediate problem is solved, and the acutely hazardous materials release is contained and cleaned up, temporary closure will proceed as described above for a closure where there is no release of hazardous materials.

2.6.3 Permanent Closure

The planned life of the generation facility is 30 years. However, if the generation facility is still economically viable and continued operation is still consistent with City policy, it could be operated longer. It is also possible that the facility could become economically noncompetitive earlier than 30 years, or that continued operation of the facility could become inconsistent with City policy within the initial 30 years of operation, forcing early decommissioning. Whenever the facility is permanently closed, the closure procedure will follow a plan that will be developed as described below.

The removal of the facility from service, or decommissioning, may range from "mothballing" to the removal of all equipment and appurtenant facilities, depending on conditions at the time. Because the conditions that would affect the decommissioning decision are largely unknown at this time, these conditions would be presented to the CEC and the City when more information is available and the timing for decommissioning is imminent.

To ensure that public health and safety and the environment are protected during decommissioning, a decommissioning plan will be submitted to the CEC for approval prior to decommissioning. The plan will discuss the following:

- Proposed decommissioning activities for the facility and all appurtenant facilities constructed as part of the facility
- Conformance of the proposed decommissioning activities to all applicable LORS and local/regional plans
- Activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities
- Decommissioning alternatives other than complete restoration
- Associated costs of the proposed decommissioning and the source of funds to pay for the decommissioning

In general, the decommissioning plan for the facility will attempt to maximize the recycling of all facility components. Unused chemicals will be sold back to the suppliers or other purchasers or users. All equipment containing chemicals will be drained and shut down to ensure public health and safety and to protect the environment. All nonhazardous wastes will be collected and disposed of in appropriate landfills or waste collection facilities. All hazardous wastes will be disposed of according to all applicable LORS. The site will be secured 24 hours per day during the decommissioning activities.

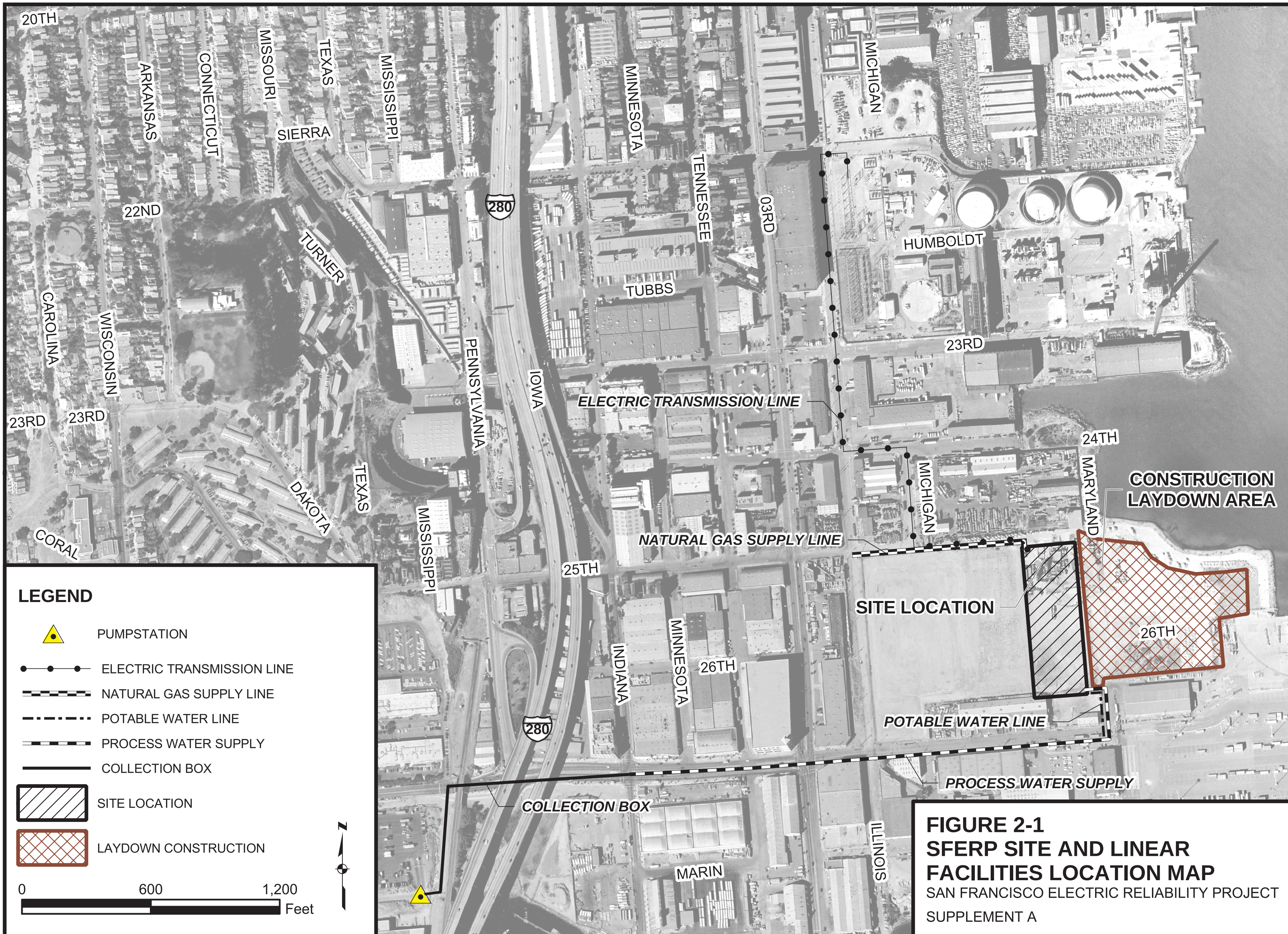

FIGURE 2-1
SFERP SITE AND LINEAR FACILITIES LOCATION MAP
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A

CH2MHILL

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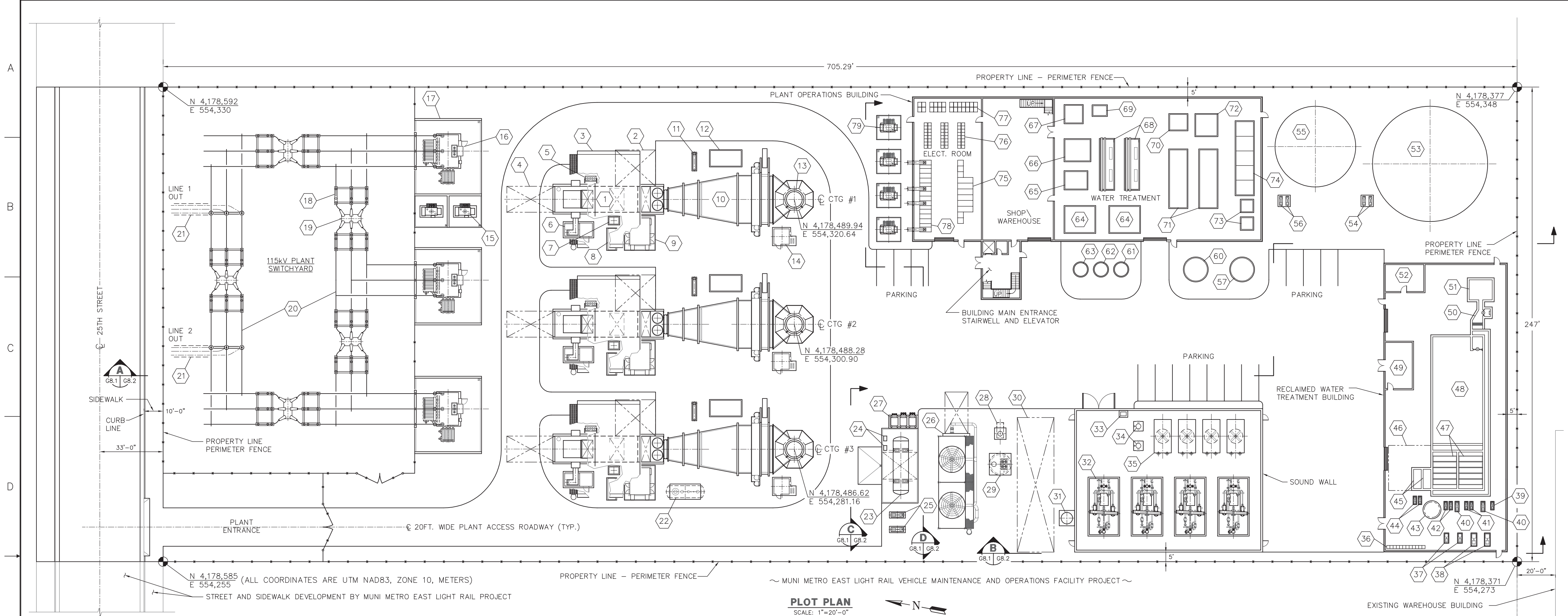
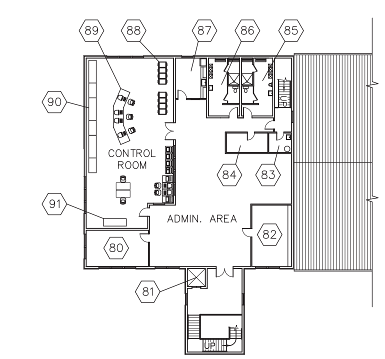


PLOT PLAN
SCALE: 1"=20'-0"

LEGEND:

TYPICAL FOR THREE UNITS (items 1–14)

1. LM6000 COMBUSTION TURBINE GENERATOR
2. TURBINE REMOVAL/MAINTENANCE AREA
3. CTG AIR INTAKE FILTER SYSTEM
4. GENERATOR ROTOR REMOVAL AREA
5. CTG FIRE PROTECTION SKID
6. GENERATOR BREAKER SWITCHGEAR
7. SPRINT SYSTEM SKID
8. NOx WATER INJECTION SKID
9. AUXILIARY SKID
10. SCR/CO CATALYST SYSTEM
11. AMMONIA FLOW BALANCE SKID
12. AMMONIA VAPORIZATION SKID
13. STACK
14. CEMS
15. 5KV AUXILIARY TRANSFORMER (TYP. 2)
16. 13.8kV/115KV GSU (TYP. 3)
17. FIRE/BLAST WALL (TYP.)
18. 115kV SWITCH (TYP. 10)
19. 115 kV BREAKER (TYP.5)
20. SWITCHYARD BUS WORK
21. 115kV DUCT BANK
22. TURBINE WASH WATER DRAIN TANK (UG)
23. AQUEOUS AMMONIA STORAGE TANK
24. AQUEOUS AMMONIA FORWARDING PUMPS
25. AUXILIARY COOLING PUMPS
26. CHILLER/COOLING TOWER PACKAGE
27. COOLING TOWER CHEMICAL SYSTEM
28. OIL/WATER SEPARATOR (UG)
29. WASTE WATER SUMP AND LIFT STATION
30. NATURAL GAS METERING STATION
31. NATURAL GAS INLET SCRUBBER
32. FUEL GAS COMPRESSOR (TYP. 4)
33. HYDROCARBON DRAIN TANK
34. DISCHARGE FILTER SCRUBBER (TYP. 2)
35. FUEL GAS COOLING RADIATOR (TYP.4)
36. 480V MCC'S
37. SUPPLEMENTAL AERATION BLOWERS
38. MEMBRANE AIR SCOUR BLOWERS
39. DRAIN PUMP
40. PERMEATE PUMP (TYP. 2)
41. MIXED LIQUOR RECIRCULATION PUMPS
42. CIP/BACKPULSE PUMPS
43. CIP/BACKPULSE TANK
44. DIP TANK RECIRC/DRAIN PUMPS
45. DIP TANKS
46. CASSETTE LAYDOWN AREA
47. MEMBRANE TANKS
48. AEROBIC ZONE
49. CHEMICAL FEED/STORAGE ROOM
50. FEED CHANNEL
51. COMBINED INLET SYSTEM
52. OFFICE/CONTROL ROOM
53. TREATED WATER STORAGE TANK
54. TREATED WATER PUMPS
55. DI WATER STORAGE TANK
56. DI WATER PUMPS
57. RO PERMEATE TANK
58. (NOT USED)
59. (NOT USED)
60. ULTRA FILTRATION PERMEATE TANK
61. BULK CAUSTIC STORAGE (IF REQUIRED)
62. BULK ACID STORAGE (IF REQUIRED)
63. BULK SODIUM HYPOCHLORITE STORAGE
64. EDI TRAIN
65. EDI FEED PUMP SKID
66. RO CLEAN IN PLACE SKID
67. RO FEED PUMP SKID
68. RO TRAINS
69. RO CARTRIDGE FILTERS
70. ULTRA FILTRATION SYSTEM WASTE SKID
71. ULTRA FILTRATION SYSTEM TRAINS
72. ULTRA FILTRATION SYSTEM PUMP SKID
73. AIR BLOWERS
74. CHEMICAL METERING SYSTEMS
75. 5kV SWITCHGEAR
76. 480V MCC'S
77. BATTERIES
78. 480V SWITCHGEAR
79. 480V STATION SERVICE TRANSFORMERS (TYP. 4)
80. PRIVATE OFFICE
81. ELEVATOR
82. CONFERENCE/TRAINING ROOM
83. JANITOR'S STORAGE
84. OFFICE SUPPLY STORAGE
85. MEN'S LOCKERS/SHOWER
86. WOMEN'S LOCKERS/SHOWER
87. LUNCH ROOM
88. INPUT/OUTPUT CABINETS
89. HUMAN/MACHINE INTERFACE
90. CTG CONTROL PANELS
91. SWITCHYARD CONTROL PANEL



PLANT OPERATIONS BUILDING - 2ND FLOOR - PLAN
SCALE: 1"=20'-0"

PRELIMINARY

GRAPHIC SCALE
1" = 20'-0" 0' 10' 20' 30' 40' 50' 60'

SYMBOL	DATE	REVISION DESCRIPTION	DRAWN	APP'D
G	3-1-05	PROPT'Y. PERIMETER FEATURES ADDED		
F	1-24-05	COORD. SYSTEM ADJUSTED		
E	1-21-05	STACK COORD. CHANGED TO METERS		
D	1-21-05	NAD83 COORDINATES ADDED AND		
		ITEMS 58 & 59 DELETED		
C	1-6-05	MUNI UNDEVELOPED SITE		
B	11-4-04	2 + 2 ACRE SITE		
A	10-21-04	PRELIMINARY ISSUE		

PB Power, Inc.
A Parsons Brinckerhoff Company
303 SECOND STREET, SUITE 700 NORTH, SAN FRANCISCO, CALIFORNIA 94107

POTRERO POWER PLANT
SAN FRANCISCO, CALIFORNIA
MUNI SITE
PLOT PLAN – 3 UNITS SIMPLE CYCLE

DR. JJB
DES. JJB
CHK. SB
APPROVED DATE
PRINCIPAL IN CHARGE DATE
DRAWING NO. G8.1
REV G
SHEET OF

X-Ref: NONE
\\Sfofpbp\Cadd\Hetch Hetchy\MUNI Site\HHWPg08-01.dwg
Date 3-1-05 11:41am Tuesday Plotted by: blazeski

FIGURE 2-2
SITE LAYOUT
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A

CH2MHILL

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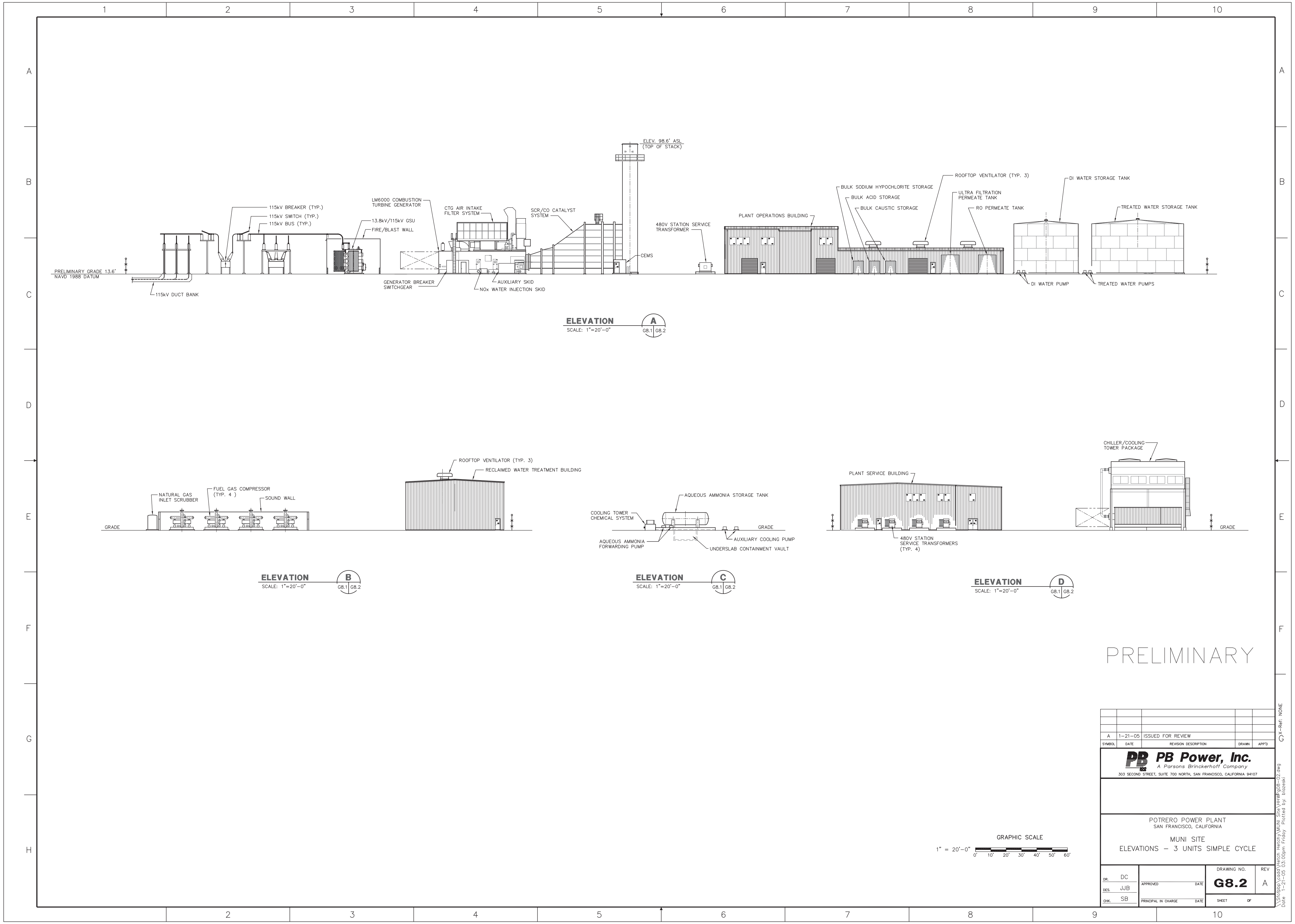
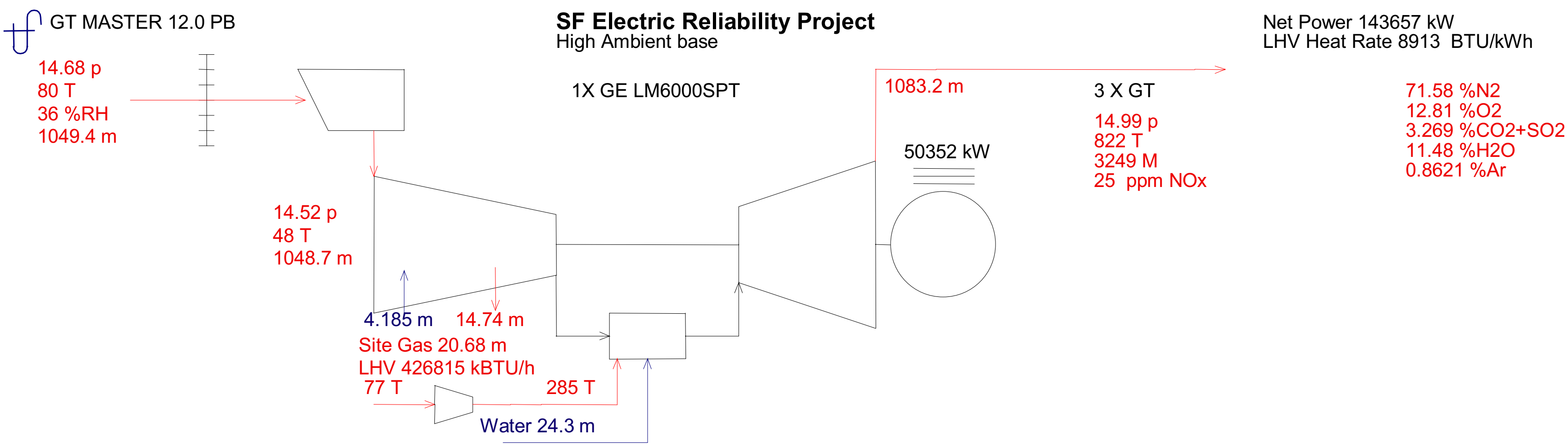


FIGURE 2-3
PLANT ELEVATIONS
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A

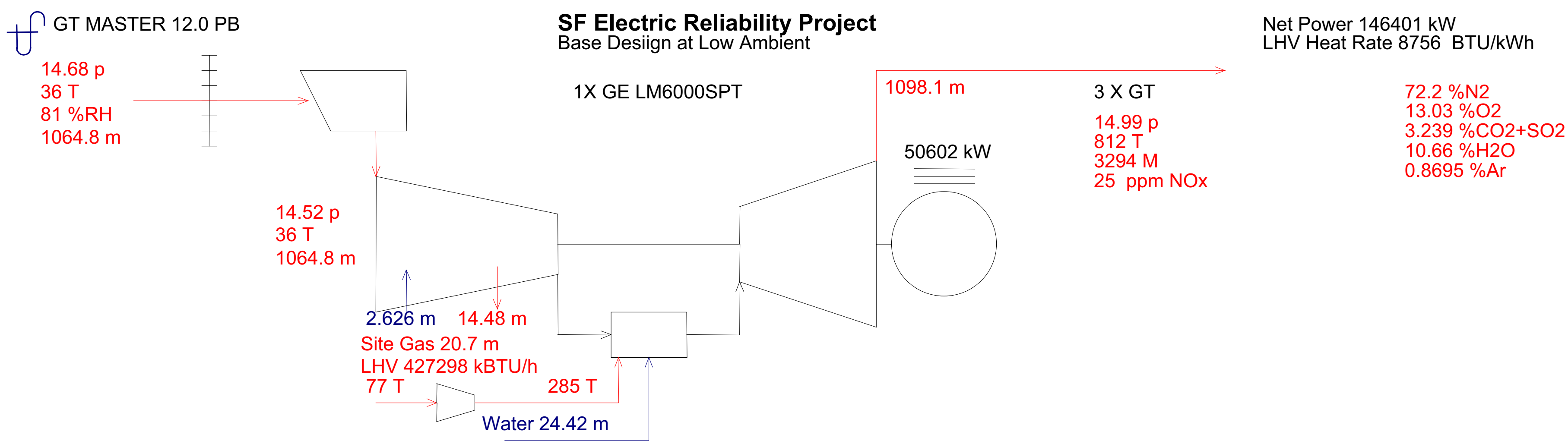
CH2MHILL

T022005001RDD_28



p[psia], T[F], M[kpph], Steam Properties: Thermoflow - STQUIK

FIGURE 2-4a
HEAT BALANCE
HIGH AMBIENT
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A



p[psia], T[F], M[kpph], Steam Properties: Thermoflow- STQUIK

FIGURE 2-4b
HEAT BALANCE
LOW AMBIENT
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A

CH2MHILL

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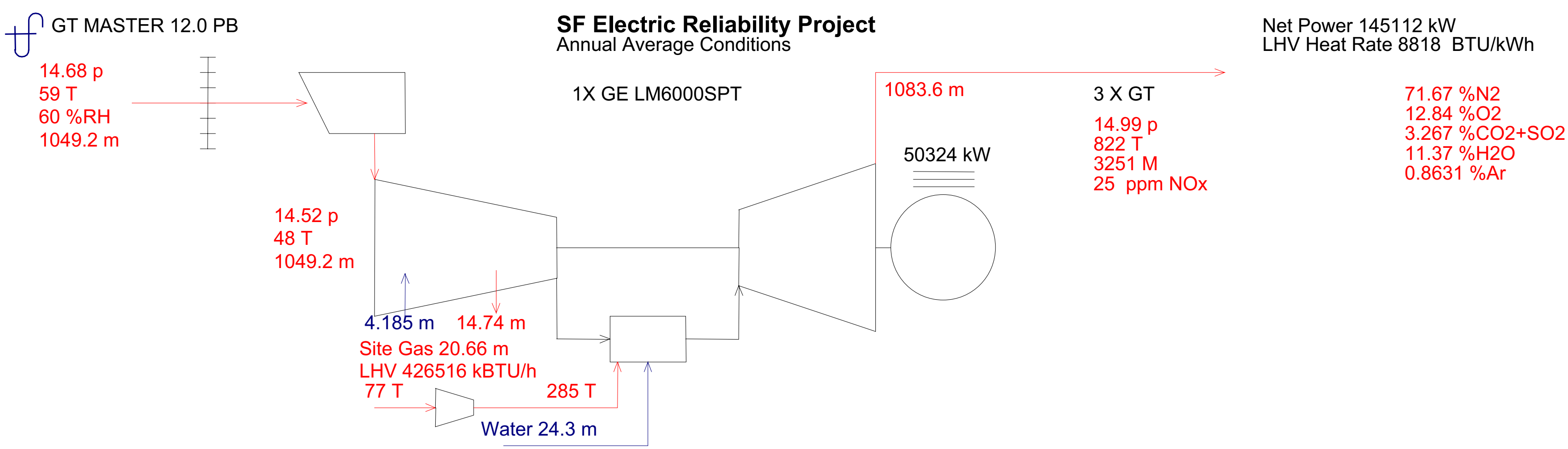

p[psia], T[F], M[kpph], Steam Properties: Thermoflow - STQUIK

FIGURE 2-4c
HEAT BALANCE
ANNUAL AVERAGE
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A

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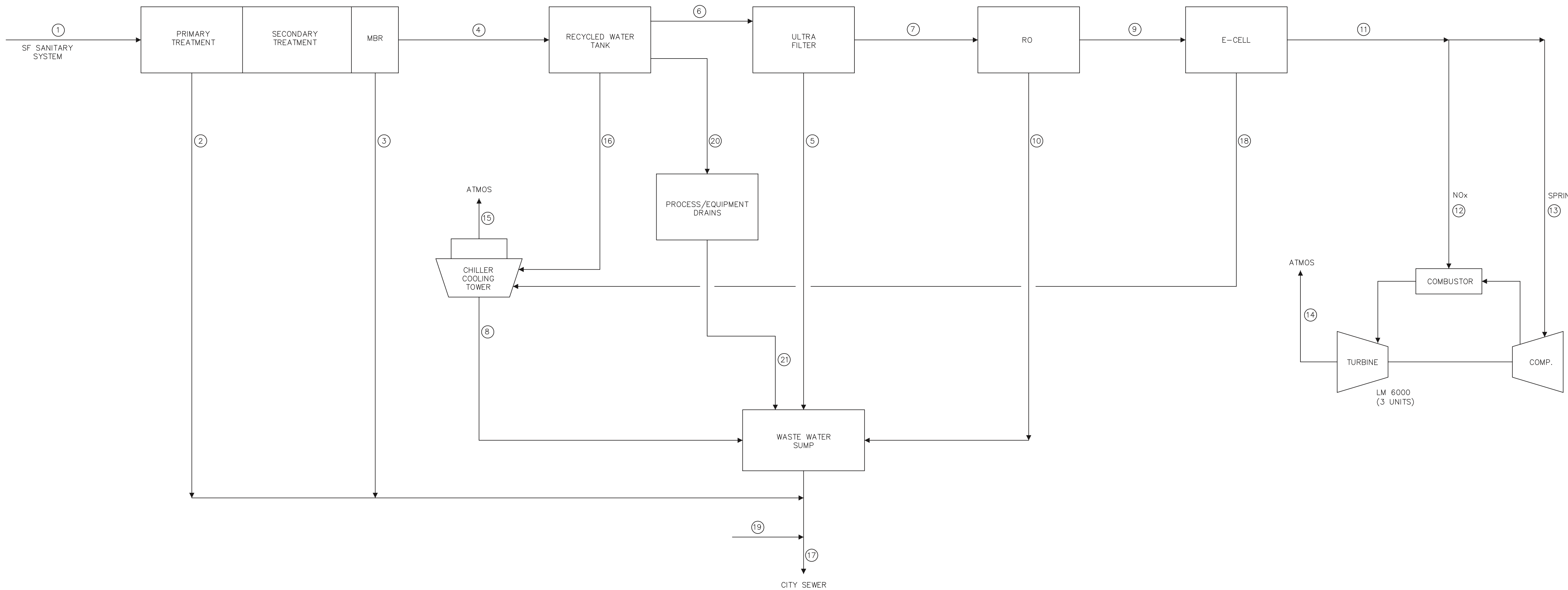

SFPUC Electric Reliability Project - Water Balance					Rev E
			Average	Maximum	Notes
			Water Use	Water Use	
			(3 CTG's in	(3 CTG's in	
			Operation)	Operation)	
Point	From	To	GPM	GPM	
No					
1	SF sanitary system	Primary/Secondary Treatment	349	408	
2	Primary Treatment	Plant wastewater system	100	100	
3	MBR	Plant wastewater system	10	12	
4	MBR	Recycled water tank	239	296	
5	Ultra Filter Reject	Plant Waste Water Sump	15	14	
6	Reclaimed water tank	Ultra Filter Inlet	222	221	
7	Ultra Filter Product	RO Inlet	207	206	
8	Cooling Tower Blowdown	Plant Waste Water Sump	5	16	(@ 5 cycles of conc)
9	RO Product	E-Cell Inlet	175	174	
10	RO Reject	Plant Waste Water Sump	33	32	
11	E-Cell Product (DI Water)	CTG NOx & SPRINT Injection	166	165	
12	E-Cell Product (DI Water)	CTG NOx Injection	141	140	@ 25 ppm NOx
13	E-Cell Product (DI Water)	CTG SPRINT Injection	25	25	
14	DI Water Evaporation	Atmosphere	166	165	
15	Cooling Tower Evaporation	Atmosphere	19	64	
16	Recycled Water Tank	Cooling Tower Makeup	15	71	
17	Plant wastewater system	City Sanitary Sewer	166	183	
18	E-Cell Reject	Cooling Tower Makeup	9	9	
19	Domestic	Plant wastewater system	2	4	
20	Recycled water tank	Plant / equipment drains	2	4	
21	Plant / equipment drains	Plant Waste Water Sump	2	4	

Annual reclaimed water usage: 43,013,015 gallons
(based on 12,000 turbine-hours) 132 acre-feet

Symbol	Date	Revision Description	Drawn	App'd
E	2-19-04	WATER BALANCE CHART ADJUSTED		
D	2-16-04	REVISED FOR 3 CTG'S		
C	1-27-04	REVISED PRELIMINARY ISSUE		
B	1-5-04	PRELIMINARY ISSUE FOR REVIEW		
A	11-18-03	PRELIMINARY ISSUE FOR REVIEW		

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SAN FRANCISCO PUBLIC UTILITIES COMMISSION
SAN FRANCISCO, CALIFORNIA

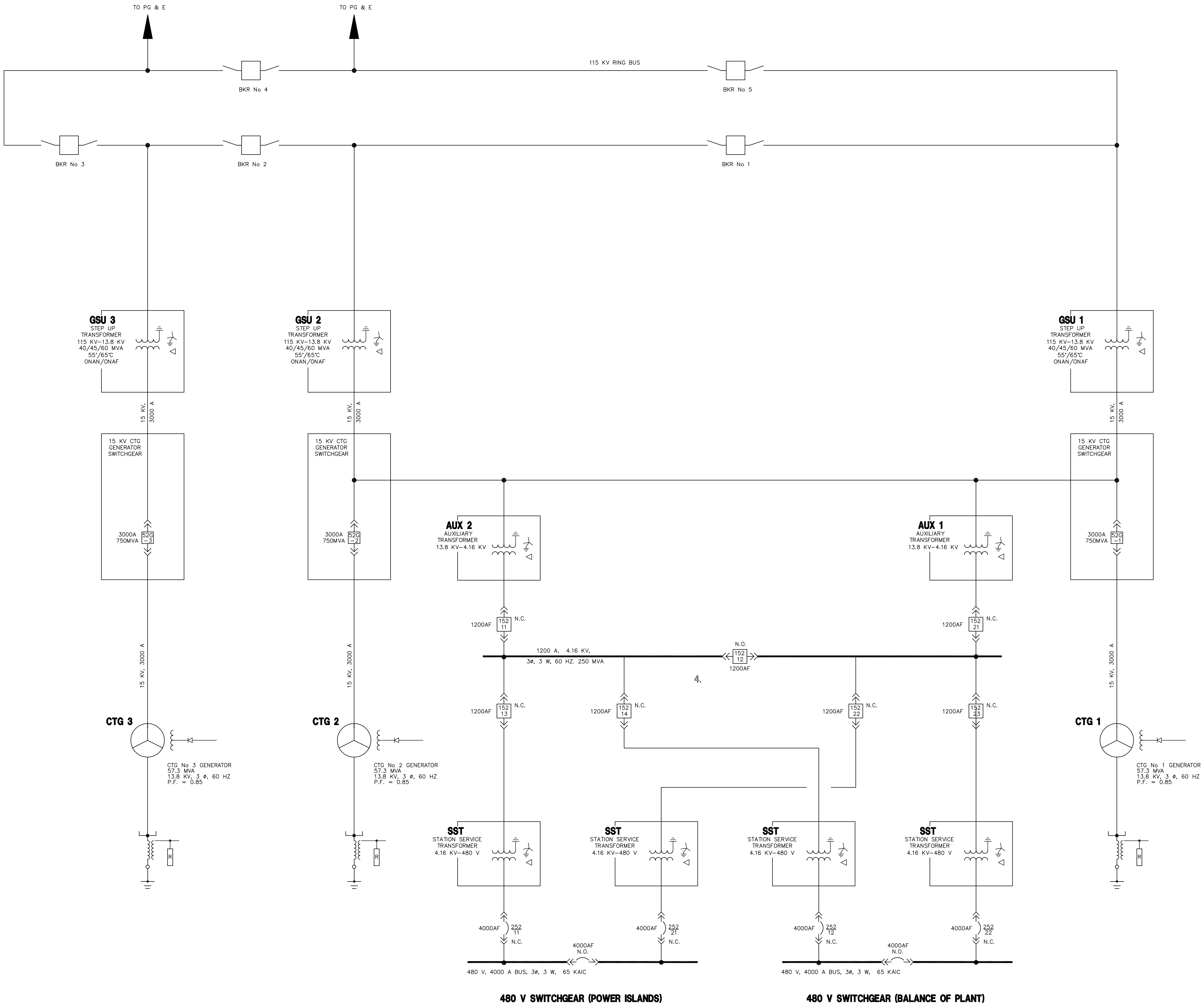
ELECTRIC RELIABILITY PROJECT
WATER BALANCE DIAGRAM

DR. LTW
DES. CM
CHK. CM
APPROVED DATE
PRINCIPAL IN CHARGE DATE
DRAWING NO. M2.2
REV E
SHEET OF

T022005001RDD_11 (2/16/05)

FIGURE 2-5
WATER BALANCE DIAGRAM
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A

CH2MHILL



C	02–19–04	REVISED EQUIP. NUMBERS & RATINGS AND ADDED 2–480V TRANSFORMERS		
B	02–06–04	REMOVED CTG 4		
A	12–29–03	PRELIMINARY ISSUE FOR REVIEW		
SYMBOL	DATE	REVISION DESCRIPTION	DRAWN	APP'D

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303 SECOND STREET, SUITE 700 NORTH, SAN FRANCISCO, CALIFORNIA 94107

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
SAN FRANCISCO, CALIFORNIA

ELECTRIC RELIABILITY PROJECT
COMPOSITE SINGLE–LINE

DR. JP	APPROVED DATE	DRAWING NO. E2.1 — REV C
DES. JP		
CHK. JE	PRINCIPAL IN CHARGE DATE	SHEET OF

FIGURE 2-6
COMPOSITE SINGLE–LINE
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A

CH2MHILL

T022005001RDD_12 (2/18/05)